DEPARTMENT OF COMMERCE AND LABOR

CIRCULAR

OF THE

BUREAU OF STANDARDS

S. W. STRATTON, DIRECTOR

No. 39

SPECIFICATIONS FOR AND MEASUREMENT OF STANDARD SIEVES

[1st Edition]
Issued December 16, 1912

WASHINGTON
GOVERNMENT PRINTING OFFICE
1912

DEPARTMENT OF COMMERCE AND LABOR

CIRCULAR

OF THE

BUREAU OF STANDARDS

S. W. STRATTON, DIRECTOR

No. 39

SPECIFICATIONS FOR AND MEASUREMENT OF STANDARD SIEVES

[1st Edition]
Issued December 16, 1912

WASHINGTON
GOVERNMENT PRINTING OFFICE
1912

SPECIFICATIONS FOR AND MEASUREMENTS OF STANDARD SIEVES

CONTENTS

		Page
I.	Introduction	3
II.	Definition, manufacture, and use of sieves	4
III.	Specifications for standard sieves	6
IV.	Examination and certification of sieves	8
V.	Rough method of measurement of sieve cloth	9
VI.	Accurate measurement of sieves	10
VII.	Certificates and reports	11
VIII.	General instructions to applicants for tests	12
	1. Application for test	12
	2. Fees and remittances	13
	3. Shipping directions	13
	4. Address	14
IX.	Schedule of fees	14

I. INTRODUCTION

Within the last decade or so there has been great improvement in the grinding of such materials as cement, graphite, paint pigments, samples of ore for analysis, abrasives, and polishing powders, the degree of usefulness of which is proportional to the fineness of grinding. With this improvement there has arisen a demand for more exact means of determining the fineness of such materials during and after grinding. This is especially true in the case of cement and has led to the precise specification and standardization of the 100- and 200-mesh sieves used in the fineness tests of cements. The use of properly tested and certified sieves prevents or settles many disputes between the manufacturer and the construction engineer.

The first efforts in the United States to secure more exact sieves by specification resulted, in 1903 and 1904, in the preparation of specifications for 100- and 200-mesh sieves by the committee on uniform methods of tests of cement of the American Society of Civil Engineers, which were later adopted by the American Society for Testing Materials, and other engineering organizations. The specifications reported by this committee were adopted tentatively and a number of sets of sieves were made up from two rolls of imported wire cloth which were supposed to conform to the dimensions and tolerances established by these specifications.

Between that time and September, 1911, this Bureau was called upon from time to time to examine sieves and certify as to whether they conformed to these specifications. However, for purposes of certification or

rejection of sieves, these specifications were quite indefinite in a number of points, particularly in that no tolerance for diameter of the wires was given and in that it was uncertain whether the mesh tolerances were to be applied to the average mesh of the whole sieve or to each inch interval measured. For these reasons and with a view to making other changes in the specifications which the results of measurements made at this Bureau showed desirable, it was decided to prepare new specifications for standard sieves auxiliary to the new specifications for Portland cement being prepared by a conference of Government engineers for application to all cement to be used by the United States Government. These new sieve specifications, given below, were adopted by this departmental conference at the meeting held February 13, 1912, and have been effective, so far as all Government construction is concerned, since the issuance of the Executive order of April 30, 1912, which ordered the use thereafter of the cement specifications recommended by the departmental conference.

II. DEFINITION, MANUFACTURE, AND USE OF SIEVES

The essential quantity in the definition of a fineness sieve of a particular size is, primarily, the size of the openings through which the particles to be sifted are to pass. For separating particles which are essentially spherical in shape or of which there is no structural reason for one dimension being greater than another these openings in the sieve should be circles or regular polygons. Up to this time it has proven most practicable to secure such openings by the weaving of wire cloth having openings between the wires equal to or greater than the diameter of the wires, giving, therefore, the square openings.

A series of fineness sieves of different sizes should have these openings vary uniformly, in theory, according to the factor of the particles sifted on the basis of which it is most desired to separate the particles. Inasmuch as most of the grinding of substances to fine particles is chiefly with the object of increasing the surface upon which some chemical action is to take place, the openings of such a series of sieves should vary in such a way that the squares of the width of the openings shall differ by equal amounts rather than the widths of the openings themselves or their cubes.

However, the specification of sieves or sieve cloth by the size of the openings between the wires is not a practicable method of definition either for the weaver or the person who is to examine the sieve for accuracy. The size of the wire and the number of meshes in a given distance each way are, rather, the easily measured quantities for manufacture and inspection of the cloth. Therefore the specified dimensions of a given-sized sieve, to which tolerances are assigned, are the diameter of the wire and the number of meshes to the inch, the size of the opening being given merely as a deduced quantity although it is primarily fixed in establishing the size of wire to be used in cloth of a given mesh.

While the weaving of cloth coarser than 100 meshes to the inch and even of some of the 100-mesh cloth is done in the United States, the finer

meshed cloth is usually imported from Scotland, England, France, or Germany. No satisfactory power loom has been devised for weaving these cloths from small wires. Hand weaving is therefore necessary.

The process of putting the warp wires on the loom is slow and tedious, and the weaving itself requires much time, skill, and patience, while frequent examination of the cloth as it is being woven is necessary as a check on the accuracy of the work. The warp wires, those extending lengthwise of the roll, are held in position by the splits or dents of the reed which gives the warp wires a constant spacing throughout the weaving of the whole roll. Hence, if the reed is accurately made, the warp wires will be correctly spaced and will be spaced practically the same (within a fraction of a mesh, probably) at all parts of the roll. The reed consists of a frame holding a series of splits, thin strips of steel, between which the warp wires run. There are, therefore, as many splits to the inch as the mesh of the cloth to be woven. The space between the splits must be slightly greater than the diameter of the wire to be used, and, consequently, for precise wire cloth, it is necessary to place these splits very carefully. Hence, inasmuch as the reed controls the spacing of the warp wires close up to the web, the accuracy of the cloth, as far as the warp wires are concerned, can be regulated by the construction of an accurate reed.

The shoot wires, those extending at right angles to the selvage, also called the woof, weft, or filling wires, are dependent for their accurate spacing upon the skill of the weaver in driving them into place with the same strength of blow of the lay or beater each time. There is likely, therefore, to be much more variation in the mesh of the shoot wires than in that of the warp ones, and for this reason a larger tolerance is allowed for the former.

The drawing of the wire for sieve cloth and annealing it is also a difficult process, especially the keeping of the wire of uniform diameter throughout the length of a skein and of circular cross section. It is hoped, however, that the new use of diamond dies will make possible the drawing of more uniform wire. Another difficulty to be corrected is the fact that the greater tension on the warp wires and the bending of them back and forth over the shoot wires tends to draw them out slightly during weaving, especially in the case of 100-mesh cloth, so that in the completed cloth the warp wires average considerably less in diameter than the shoot wires. This difference has averaged over 0.0003 inch in the case of the 100-mesh sieves that have been tested since the adoption of the Bureau of Standards sieve specifications.[1]

There are a number of uses to which sieves and sieve cloth are put besides the fineness determinations in the manufacture and testing of cement and similar products. In some of these uses accurate or carefully graded sieves are required; in others knowledge of the exact size of the openings is not required. In chemical laboratories they are used for both

[1] For further details of the methods of weaving wire cloth for fine sieves, see Proc. Am. Soc. for Testing Materials, **4**, pp. 550–556, 1904: Clifford Richardson, "The Modern Asphalt Pavement," pp. 59–64.

physical separation of materials and for mixing chemicals, as well as for analyses and plotting of curves. The cloth is also used for filtering; also in centrifugal machines. Commercially it is used extensively in the manufacture of paints and varnishes, in paper machines, in flour mills, and for general commercial sifting. Use for the cloth is also found in a number of manufactured articles.

The method of use of the sieves for determining the fineness of cement has been particularly specified in the United States Government Specifications for Portland cement, as follows:

"22. The No. 100 and No. 200 sieves shall conform to the standard sieve specifications of the Bureau of Standards, Department of Commerce and Labor.

"23. The determination of fineness should be made on a 50-gram sample, which may be dried at a temperature of 100° C. (212° F.) prior to sifting. The coarsely screened sample should be weighed and placed on the No. 200 sieve, which, with the pan and cover attached, should be held in one hand in a slightly inclined position and moved forward and backward in the plane of inclination, at the same time striking the side gently about 200 times per minute against the palm of the other hand on the upstroke. The operation should be continued until not more than 0.05 gram will pass through in one minute. The residue should be weighed, then placed on the No. 100 sieve, and the operation repeated. The sieves should be thoroughly dry and clean. Determination of fineness may be made by washing the cement through the sieve or by a mechanical sifting device which has been previously standardized with the results obtained by hand sifting on equivalent samples. In case of the failure of the cement to pass the fineness requirements by the washing method or the mechanical device, it shall be tested by hand."

Where a laboratory is not equipped throughout with standard sieves but has one or more sets of standard sieves and it is wished to obtain correction factors to the other sieves this can be done by sifting equivalent samples by the above method on the standard sieves and on the sieves in question and the difference between the two results is used as a correction factor.

III. SPECIFICATIONS FOR STANDARD SIEVES

The specifications for standard sieves of 100, 200, 20, and 30 mesh prepared by this Bureau and adopted by the Departmental Conference on Portland Cement Specifications, mentioned above, as the specifications for sieves to be used in the fineness tests of all cement for the use of the United States Government are as follows:

BUREAU OF STANDARDS SIEVE SPECIFICATIONS

Wire cloth for standard sieves for cement and sand shall be woven (not twilled) from brass, bronze, or other suitable wire, and mounted on the frames without distortion.

The sieve frames shall be circular, about 20 cm (7.87 in.) in diameter, 6 cm (2.36 in.) high, and provided with a pan about 5 cm (1.97 in.) deep, and a cover.

NO. 100 CEMENT SIEVE, 0.0055-INCH OPENING

The No. 100 sieve should have 100 wires per inch and shall conform to the following specifications of diameter of wiree and size of mesh:

The diameter of the wires in the sieve should be 0.0045 inch and the average diameter of such wires as may be measured shall not be outside the limits 0.0042 to 0.0048 inch for either warp or shoot wires. The number of warp wires per whole inch, as measured at any point of the sieve, shall not be outside the limits 98 to 101 per inch, and of the shoot wires 96 to 102 per inch. For any interval of 0.25 to 0.50 inch, in which the mesh may be measured, the mesh shall not be outside the limits 95 to 101 wires per inch for the warp wires and 93 to 103 wires per inch for the shoot wires.

NO. 200 CEMENT SIEVE, 0.0029-INCH OPENING

The No. 200 sieve should have 200 wires per inch and shall conform to the following specifications of diameter of wire and size of mesh:

The diameter of the wires in the sieve should be 0.0021 inch and the average diameter of such wires as may be measured shall not be outside the limits 0.0019 to 0.0023 inch for either warp or shoot wires. The number of warp wires per whole inch, as measured at any point of the sieve, shall not be outside the limits 195 to 202 per inch, and of the shoot wires 192 to 204 per inch. For any interval of 0.25 to 0.50 inch, in which the mesh may be measured, the mesh shall not be outside the limits 192 to 203 wires per inch for the warp wires and 190 to 205 wires per inch for the shoot wires.

NO. 20 SAND SIEVE, 0.0335-INCH OPENING

No. 20 sieves shall have between 19.5 and 20.5 wires per whole inch of the warp wires and between 19 and 21 wires per inch of the shoot wires. The diameter of the wire should be 0.0165 inch and the average as measured shall not vary outside the limits 0.0160 to 0.0170 inch.

NO. 30 SAND SIEVE, 0.0223-INCH OPENING

No. 30 sieves shall have between 29.5 and 30.5 wires per whole inch of the warp wires and between 28.5 and 31.5 wires per whole inch of the shoot wires. The diameter of the wire should be 0.0110 inch and the average as measured shall not vary outside the limits 0.0105 to 0.0115 inch.

Some of the reasons for the adoption of the principal features of the above specifications are as follows:

Twilled cloth is excluded chiefly because of the greater size of the openings in twilled cloth than in plain woven cloth of the same mesh and

wire diameter, and because of the variability of these openings. For in twilled cloth, while the wire bounding an opening on one side passes from above the wire on one side to below the next wire as in plain woven cloth, the bounding wire on the other side of the opening passes either over or under both of the wires at right angles to it, and because of the fact that the shoot wires are bent less than the warp wires this wire is displaced above or below the central plane of the cloth enough to increase the size of the openings as much as 17 per cent in some cases.

Suitable sieves are now made from both brass and bronze wires, hence both materials are allowed.

Inasmuch as there is a quantity element in the directions for the use of sieves, given above, which is a function of time and, as such, a function of the diameter of the sieves, it is necessary to fix the diameter of the sieves. This requirement is being enforced to within about 0.2 inch.

The allowance in the diameters of the wires of the sieves is that which is apparently necessary, as shown by the variations found in the sieves that have been measured at this Bureau, in order that too great a number may not be rejected. The limits are applied separately to the means of the warp and the shoot wires in the hope of bringing about the remedying of the existing differences between the sizes of the two mentioned above. It is also expected that these tolerances may be reduced in time with the improvements in the accuracy of drawing wires.

Tolerances of mesh above the nominal sizes of 200 and 100 are allowed in order that the mesh may be made more nearly that of the nominal amount intended. The tolerances above the nominal sizes are not quite as large as those below, for, with cloth having the wires so nearly equal to the spaces between them, there is likely to be greater variation from the nominal mesh below it than above it.

Uniformity of mesh is sought by the application of the tolerances to each whole-inch interval measured and also by the introduction of a quarter-inch tolerance.

The tolerances for the mesh of warp wires are less than for the shoot wires for the reasons given above, that is, because the former can be placed much more accurately and uniformly than the latter.

IV. EXAMINATION AND CERTIFICATION OF SIEVES

Measurements of sieves and sieve cloth are made by the Bureau of Standards for any department, bureau, office, or independent establishment of the Government, or for State or city governments, or for manufacturers or users of sieves, or for other testing laboratories. The schedule of fees for these tests will be found on page 14. Sieves which conform to the above specifications are stamped with the seal of the Bureau and an identification number, and are accompanied by a certificate showing the results of the measurements, the identification number being given on the certificate.

When the sieve tested does not conform to the specifications, a report is furnished giving the results of the measurements and the counts under the various items of specification upon which it was rejected. Sieves of other sizes and dimensions than those given in the specifications above will also be tested upon request, and a similar report of the results furnished.

The measurements made are to determine the average diameter of the wire and the average mesh of the cloth per linear inch. The certificates and reports also show the range of mesh found, both over whole-inch and quarter-inch intervals. These measurements are made for both the warp wires and for the shoot or filling wires, and the results of each are given. The warp wires can be differentiated from the shoot wires by the greater bending of the former and are indicated on each sieve tested by the stamping of the Bureau of Standards number and seal on the rim at one end of the diameter extending in the direction of the warp wires.

The rejection of a sieve may be based, therefore, upon the size of the sieve frame, the method of weaving, the average diameter of either the warp or shoot wires, or for any whole-inch or quarter-inch interval of either warp or shoot wires which is outside the tolerances for mesh. The quarter-inch tolerances are, necessarily, a little more liberal than those for whole-inch intervals. Accordingly, it is possible for a sieve to be rejected for having whole-inch intervals outside the tolerances while the quarter-inch intervals are all within tolerance, which would indicate that while the sieve was slightly below or above the general tolerance it was fairly uniform. If the cloth was uniform in mesh but widely outside of tolerance, it would be rejected for both whole-inch and quarter-inch intervals not conforming to the specifications, while a sieve which was very irregular, but, on the whole, was well within the general tolerances, might be rejected for quarter-inch intervals outside the limits but not for whole-inch intervals.

V. ROUGH METHOD OF MEASUREMENT OF SIEVE CLOTH

A very satisfactory method of examination of the mesh of sieve cloth, especially with a view to determining what portions of the cloth are suitable for use in standard sieves, is that making use of a graduated glass scale laid over the cloth. The scale should be at least 2 inches long, preferably 6 or 8 inches in length, which is the width of cloth necessary for a sieve. It should be graduated throughout its entire length to fiftieths of an inch, or preferably to hundredths, the lines being one-fourth of an inch or more in length and about 0.003 inch wide. The scale is laid over a section of the cloth with the graduated surface next to the cloth and the lines of the scale parallel to the wires of the cloth. When these are viewed by transmitted light, dark and light bands will appear along the scale if the cloth is not exactly 100- or 200-mesh. Where the lines of the scale coincide with the wires of the cloth the light is permitted to pass through the openings between, while in other sections of the cloth where the lines of the scale cover or partly cover the openings between the wires of the cloth the light is partially cut off, producing the dark band. As many dark bands will appear in an inch of the scale

as the mesh of the cloth in that section differs from the nominal mesh if that inch of cloth is entirely over nominal mesh or entirely under mesh. To determine whether the cloth is over or under mesh, one moves the scale slowly over the cloth in the lengthwise direction of the scale. As the lines of the scale which were over open spaces in the cloth move to coincidence with wires of the cloth the dark bands appear to move along the scale. If the bands advance in the same direction in which the scale is being moved, the mesh of the cloth is less than the nominal amount; if they move in the opposite direction, the cloth is running over the nominal size in that section. If in a certain portion of the cloth the mesh is over the nominal mesh while in an adjacent section it changes to less than the nominal mesh, the bands in these two sections will either appear to approach each other and unite and disappear at the point where the mesh is just correct, or, if the motion of the scale is reversed, new bands will form at this point, split apart, and move off in opposite directions. Under favorable conditions determinations of mesh by this method can be made to one-quarter of a mesh.

One can judge of the uniformity of the cloth also, and, therefore, of the likelihood of the cloth passing the quarter-inch tolerances, by the uniformity of spacing of the bands. It is not necessary to have the lines of the scale exactly parallel with the wires of the cloth, for, if the scale is rotated so that the bands are nearly parallel to the axis of the scale, the straightness of the bands is another indication of the uniformity of the cloth.

Because of the fact mentioned before that the warp wires have practically the same spacing throughout a whole roll of cloth, the spacing being dependent upon the spacing of the splits in the reed of the loom, such an examination of the warp wires made across a roll at one point can be applied to other points and cloth selected in accordance therewith without further examination of the mesh of the warp wires.

VI. ACCURATE MEASUREMENT OF SIEVES

For the accurate determination of the mesh of a sieve use is made of a similar scale, preferably only 2 inches long and having the quarter-inch lines made longer than the others. The sieve is mounted on a sliding carriage underneath a low-power microscope, with some means of illumination from both above and below the sieve. The scale having been laid on the sieve as before, with its lines parallel to the wires and the zero line in coincidence with one of the wires near the edge of the sieve, the carriage bearing the sieve is moved slowly beneath the microscope and readings of the mesh, estimated to tenths of a mesh, are made at each quarter-inch point. With a scale graduated to fiftieths of an inch there will be four meshes of 200-mesh cloth to each space on the scale or two of 100-mesh cloth. Whether each space has this many can be seen at a glance, and it is not necessary to count all the wires from the beginning of the inch, but merely to note the slight variations of the mesh at each tenth of an inch on the scale as evident in the increasing offset of the successive lines of the scale from coincidence with the wires of the cloth. Only in the case of extremely irregular cloth is it necessary to actually count the meshes. Having made readings over the 2

inches of the scale, the scale is moved along to the next 2 inches and the readings continued.

Because of the impracticability of calipering wires already mounted in a sieve it is necessary to adopt some other method of determining the diameter of the wires. The method used at the Bureau is one involving the run of the screw of a micrometer microscope of which the value of a revolution of the screw is known in inches. Settings of a single thread in the microscope parallel to the sides of the wires, or of a pair of crossed threads, are made on each side of the wire, the microscope being set perpendicular to the cloth. Such readings can be made to an accuracy of two or three hundred-thousandths of an inch. The average diameter of five or more wires in various parts of the sieve in each direction is taken as giving a fair mean for the sieve.

Even with unmounted cloth from which wires may be pulled or cut for calipering the above method of measurement is preferable. For with wires of such small radius of curvature the screw of a micrometer caliper exerts a comparatively large force and is liable to compress the wire with any but the lightest touch, and even with a skillful light touch it is not likely that uniform results will be obtained, because of the difficulty of obtaining true diameters of wires which are bent, as are the wires taken from a piece of cloth, for they can not be straightened out after removal from the cloth without danger of changing their diameter by stretching.

VII. CERTIFICATES AND REPORTS

The results of an examination of a sieve are given in the form of a certificate for a sieve which conforms to the above specifications for 100, 200, 20, and 30-mesh sieves, and in the form of a report for such sieves as do not pass these specifications and for sieves of other meshes or sizes than the above. The certificate shows the average mesh of the warp wires and also of the shoot wires and the average diameters of each kind; the range of mesh in whole-inch intervals and also in quarter-inch intervals is also given for both the warp and shoot wires. The Bureau of Standards identification number stamped on a sieve which passes the specifications is also given on the certificate, so that a given certificate may be identified with the particular sieve to which it applies. Sieves which pass the Bureau's specifications are also stamped on the rim, at one end of the diameter extending in the direction of the warp wires, with the seal of the Bureau. Sieves which do not conform to the specifications are not stamped with either the seal or a Bureau of Standards number.

The report made upon the results of the measurement of a rejected sieve shows the average mesh, and, when measured, the average diameter of the wires, and the ranges of the mesh in whole-inch and quarter-inch intervals, as in the certificates, and also gives the number of whole-inch and quarter-inch intervals which were found to be either below the minimum tolerances or above the maximum tolerances, and any other points under which the sieve is rejected. The Bureau of Standards sieve specifications are printed on the second sheet of both the certificate and the report.

The mesh of a sieve will always be measured first and, if it is found that the sieve is rejected for mesh, the diameters of the wires will not be measured, and only half the usual fee will be charged in such a case.

In addition to the examination of sieves the Bureau will also make examinations of unmounted cloth to determine what parts are suitable for use in standard sieves. As stated before, such measurements of the warp wires can probably be applied throughout a whole roll of cloth and the measurements of the shoot wires can be assumed to hold across the roll. The reports on the results of such measurements as these will be merely statements of what parts of the cloth would probably be suitable for standard sieves. In addition, measurements will be made, if requested, of the diameters of a number of wires in each direction in a given piece of cloth to determine what the average diameter is for that piece. Such measurements as these of pieces of unmounted cloth are not to be regarded in any sense as a substitute for the measurement and certification of the sieve afterwards made up from the cloth.

VIII. GENERAL INSTRUCTIONS TO APPLICANTS FOR TESTS

1. APPLICATION FOR TEST

All articles submitted for test should be accompanied by a written request for the test. This request should enumerate the articles, should give the nominal sizes of mesh of the different sieves or pieces of cloth, and, in the case of pieces of cloth, should state explicitly the test desired. When sieves submitted are to be tested for agreement with the specifications and certification the application should state whether any sieves that may be rejected are to be returned to the manufacturer to be replaced or to the party submitting them for test. In the case of new sieves it is not necessary that they be submitted by the purchaser, for they may be ordered from the manufacturer with instructions to send them first to this Bureau for certification, the sieves to be forwarded to the purchaser when found to conform to the specifications. It may, in some cases, be possible to obtain from the manufacturer directly sieves accompanied by the Bureau's certificate showing that they have already been tested here, in case the manufacturer has previously submitted a supply to this Bureau for test and thus acquired a stock of certified sieves. Such a method is greatly to be preferred, as it saves much delay in the filling of orders, both in the shipment of sieves to the Bureau, the time necessary to complete the test and occasionally the time lost in replacing rejected sieves.

When sieves are submitted which it can be seen by a cursory inspection do not conform to the Bureau's specification, such as sieves of other meshes or other diameter than 20 cm (7.87 inches) or sieves made from twilled cloth, which it is desired to have measured and a report given notwithstanding these points in which the sieve does not meet the requirements, these facts should be noted in the letter of application in order to avoid the loss of time necessary for a preliminary letter from the Bureau

calling the applicant's attention to these facts and requesting further directions before proceeding with the test or returning the sieves.

When pieces of sieve cloth are submitted for examination the applicant should state whether examination of the mesh of the warp wires only is desired or of the shoot wires also, and whether the measurement of the diameters of the wires is desired. Owing to the dimensions of the Bureau's apparatus it is impracticable to examine the mesh of the shoot wires of a piece of cloth longer than a yard unless the piece is cut into strips of 18 inches or less in width. However, this cutting into strips will be done at the Bureau, if requested, after making measurements of the mesh of the warp wires, the piece being cut lengthwise in accordance with the results of these measurements before proceeding with the measurements of the shoot wires, avoiding the necessity of returning the cloth for cutting before the shoot-wire measurements are made.

2. FEES AND REMITTANCES

Fees in accordance with the schedule below should be sent when the articles are shipped, or promptly upon receipt of bill. The remittance of fees with the application for test is often of decided advantage in the saving of time in the return of articles, as certificates are not given, nor is apparatus returned, until the fees due thereon have been received. *Remittances may be made by money order or check drawn to the order of the Bureau of Standards.*

Transportation charges both ways must be paid by the party submitting the articles for test.

As stated above, the mesh of a sieve will be examined first, and, if the sieve is rejected for errors of mesh, only $1 will be charged for each sieve so rejected. If the full fee of $2 per sieve has been paid in advance, a refund will be promptly made on any sieves rejected for mesh. If, however, a sieve which conforms to the specifications in mesh is afterwards rejected for diameters of wire outside the tolerances, it will be necessary to charge the full fee of $2, as the fees are made to just cover the cost of each test. As the test of sieves of a smaller number of meshes, such as 20 or 30 mesh sieves, requires just as much time for measurements, preparation of reports, packing, etc., as sieves of more meshes the fee is the same for all sizes.

3. SHIPPING DIRECTIONS

Sieves or pieces of cloth should be securely packed in cases or packages which will not be broken in transportation and which may be used in returning them to the owner. Great care should be taken in packing, especially to protect the cloth from puncture. Pieces of cloth should, in the case of small pieces, be shipped between flat boards, or, in the case of longer pieces, they should be rolled carefully on round rods or tubes to prevent bending in handling.

The shipment in both directions is at the applicant's risk and expense. It is recommended that shipment be made by express. The tops of boxes should, preferably, be put on with screws to facilitate their use for return

of the articles and should have their return or forwarding address on the under side. All packages should be plainly marked with the shipper's name and address and, when convenient, with a list of the contents. The charges for shipment to the Bureau must be prepaid, and unless otherwise provided articles will be returned or forwarded by express "collect." In case it is desired that the Bureau should prepay the returning or forwarding charges the money for the same should be sent separate from the remittance of fees, in stamps when the shipment is to be made by mail, or by money order or check drawn to the order of the express company which is to make the shipment from Washington—either the Adams Express Co., the American Express Co., or the United States Express Co., when shipment is to be by express.

4. ADDRESS

Articles submitted for test, as well as all correspondence, should be addressed simply "Bureau of Standards, Washington, D. C."

IX. SCHEDULE OF FEES

SCHEDULE 9. STANDARD SIEVES AND SIEVE CLOTH

(*a*) Test and certification of any sieve conforming to the specifications of the Bureau of Standards	$2.00
(*b*) Test and report of any sieve which is rejected for mesh outside the tolerances	1.00
(*c*) Test and report of any sieve which passes specifications as to mesh but is rejected for average diameter of wires	2.00
(*d*) Test and report of any sieve not conforming to other parts of the specifications or purchased on any other specifications	2.00
(*e*) Test and report of the mesh of warp wires of a piece of sieve cloth.....per linear foot..	.60
(*f*) Test and report of the mesh of shoot wires of a piece of sieve cloth.....per linear foot..	.60
(*g*) Determination of the average diameter of a number of wires in each direction in a piece of sieve cloth	1.00

(*h*) A discount of 10 per cent on the fees above under (*a*) to (*d*), inclusive, will be allowed when sieves are submitted in lots of five or more at a time.

Government or State authorities entitled to tests free of charge under the law must make application in writing for each test in order to avail themselves of the privilege.

S. W. Stratton,
Director.

Approved:
Benj. S. Cable,
Acting Secretary.